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MONITORING WELL REPORT

YAKIMA AGRICULTURAL RESEARCH LABORATORY
CLOSURE OF HAZARDOUS WASTE SEPTIC SYSTEM

August 29, 1990
Our Project Number 90042

Prepared for
U.S. Department of Agriculture

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[redacted] 3.2 [redacted]

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MONITORING WELL REPORT

YAKIMA AGRICULTURAL RESEARCH LABORATORY

CLOSURE OF HAZARDOUS WASTE

SEPTIC SYSTEM

To complete the required RCRA ground water monitoring system, three monitoring wells were installed by Hong West & Associates (HWA) at the Yakima Agricultural Research Laboratory (YARL) between June 18th and August 6th, 1990. Two shallow upper aquifer monitoring wells were installed down-gradient from the septic tank site (MW-F and -G), and one deeper monitoring well for use in calculating vertical gradients (MW-E) was installed. Figure A-1 shows the locations of all monitoring wells at YARL. Wellhead horizontal locations (to the nearest .1 ft) and elevations (to the nearest .01 ft) were surveyed by Gray Surveying on August 14, 1990. All drilling, well construction and development was supervised and inspected by Hong West & Associates' geologists. Boring logs were prepared on site by the geologist during well drilling and construction and modified accordingly after reviewing samples in the lab/office. Table A-1 presents a summary of the YARL monitoring well construction details. Refer to the accompanying well logs for lithologic and well construction details.

1.0 EQUIPMENT/DECONTAMINATION

Drilling for this project was performed with a Mobile B-80 hollow stem auger drill rig and a CP-650 air rotary drill rig owned and operated by Ponderosa Drilling of Spokane, Washington.

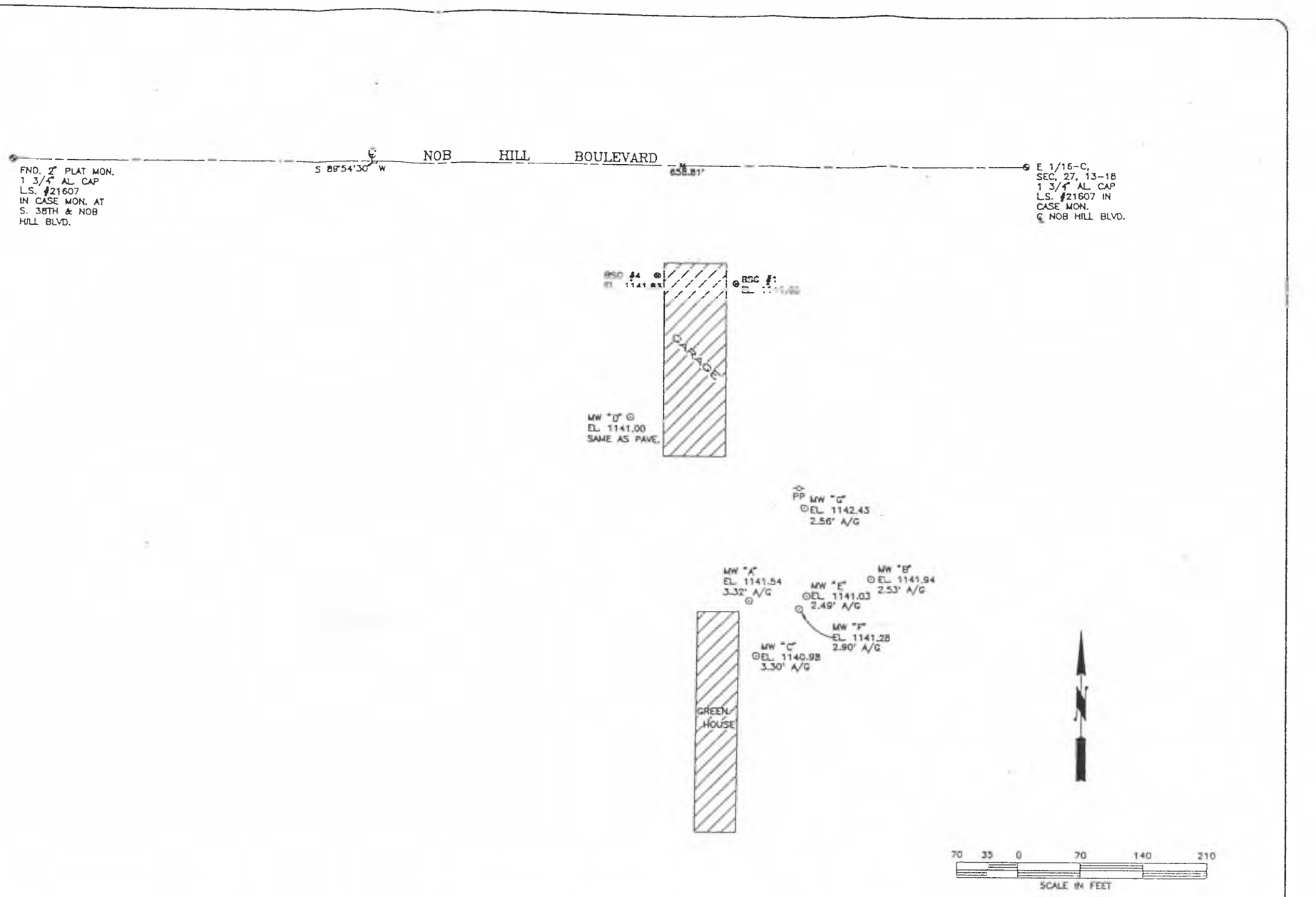
All drilling equipment was pressurized-hot water washed/steamed cleaned prior to entering and after leaving each borehole site. In addition, all downhole drilling tools were pressurized-hot water washed/steam cleaned between borings.

2.0 DRILLING

All borings were drilled using the air rotary rig, with the exception of the upper 20 feet of MW-G which was drilled with the hollow stem auger rig to refusal. The air rotary used a "drill and drive" method. A 6" diameter tricone bit was advanced two to five feet below the the 6" steel drill casing after which the casing was hammer driven to the drilled depth. A 6" diameter drive shoe was welded to the bottom of the initial length of 6" drill casing. A twenty foot, 5" diameter stabilizer and twenty foot, 4-1/2" diameter drill rods were used to advance the boring. Cuttings were removed from the hole by compressed air.

3.0 SAMPLING

Samples were collected at the end of the 6" diameter air discharge tube. Sampling intervals were typically every five feet or less. After field inspection by the HWA geologist, samples were sealed and labeled in air-tight containers for transportation to HWA's soils laboratory for analysis.



EQUIPMENT AND PROCEDURES USED:
a: 5 SEC. EDM TOTAL STATION
b: FIELD TRAVERSE

DATE	REVISIONS

AUDITOR'S CERTIFICATE

FILED FOR RECORD THIS _____ DAY OF _____ 19__
AT _____ M. IN BOOK _____ OF _____
_____, PAGE _____
RECORDS OF YAKIMA COUNTY, WASHINGTON AT THE
REQUEST OF _____

_____ _____
COUNTY AUDITOR BY DEPUTY

SURVEYOR'S CERTIFICATE

THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE REQUIREMENTS OF THE SURVEY RECORDING ACT.

_____ DATE _____
DOUGLAS S. GRAY

● CORNER FOUND
○ CORNER W/CAP SET
⊗ NAIL W/WASHER SET

Gray Surveying
PROPERTY CONSTRUCTION DEVELOPMENT
P.O. Box 810 2520 W. Washington Ave.
Yakima, Wa 98907 (509) 575-6434

CERT. NO. 15908

NAME HONG WEST & ASSOCIATES
P. O. BOX 595, LYNNWOOD, WA 98036
LOCATION SE 1/4, SEC. 27, T. 13 N., R. 18 E., W.M.
DRAWING TYPE TOPOGRAPHIC SURVEY
DRAWN BY: DRL
APPROVED BY: DSG
PROJECT NO. 90124
PARCEL NO.
SCALE
DATE: 8-24-90
SHEET 1 OF 1

Figure A-1

4.0 WELL COMPLETION

All monitoring wells were completed using threaded 2-inch PVC pipe as a riser and a ten-foot section of screen with 0.020-inch slot widths, with the exception of MW-E which had a 2.5 foot screen. A filter pack of Colorado 10/20 silica sand was placed around each screen and bentonite chips and a bentonite grout were used to seal and backfill the annular space. As the pipe and backfill were placed, the 6" diameter drill casing was withdrawn from the hole, with the exception of MW-E (see section 7.0). An 8-inch diameter security casing with a locking lid was installed at the surface and embedded in concrete, and protected by three 4 foot high steel bollards.

5.0 DEVELOPMENT

All monitoring wells were developed using a single pipe airlift technique. 100 CFM compressed air, filtered for both liquid and particulate matter, was conducted to the screened zone through a 1 inch continuous PVC pipe. A separate length of PVC development pipe was dedicated to each well. The pipe was systematically raised and lowered over the screen during development. Samples of the water lifted during development were tested at regular intervals for pH and conductivity. Development was continued until water ran clear and pH and conductivity stabilized. The volume of well development water was approximately 40 gallons for each well. The well development water was placed in drums for evaporation.

6.0 PUMP INSTALLATION

HWA installed three dedicated Well Wizard pumps (Model T-1200) in monitoring wells MW-E, -F and -G on August 6, 1990. Each pump consists of a stainless steel body fitted with a teflon bladder and stainless steel slot .010" screen. Model T-1200 is 41.14" in length and 1.5" in diameter. Both the "air" supply lines and water (discharge) line will consist of Teflon-lined polyethylene. Each pump was connected to a well cap assembly (Model 2120A). The Well Wizard system is driven with an automatic controller (Model 3013) equipped with adjustable purge and sample rates. Bottles of nitrogen gas will be leased to drive the controller/pump.

Each pump and tubing assembly came decontaminated and sealed in a plastic container from the factory. The seals were broken on-site prior to installing the assembly in each monitoring well. Prior to installation the unit was rinsed externally with distilled water. The pump and tubing were lowered into the hole carefully by hand with minimal contact with the PVC well casing. Non-contaminating gloves were worn at all times by field personnel installing the dedicated pump system.

Each pump was set approximately 2 feet from the bottom of the well screen. Each of the three new Well Wizard pump systems were assembled to HWA specification at the QED Environmental Systems, Inc. facility in Ann Arbor, Michigan. No tubing required modification to its length.

Figure A-2 is a schematic diagram of a Well Wizard monitoring well pump system.

7.0 MONITORING WELL MW-E

This well was drilled, installed, and developed between June 20th and July 9th, 1990.

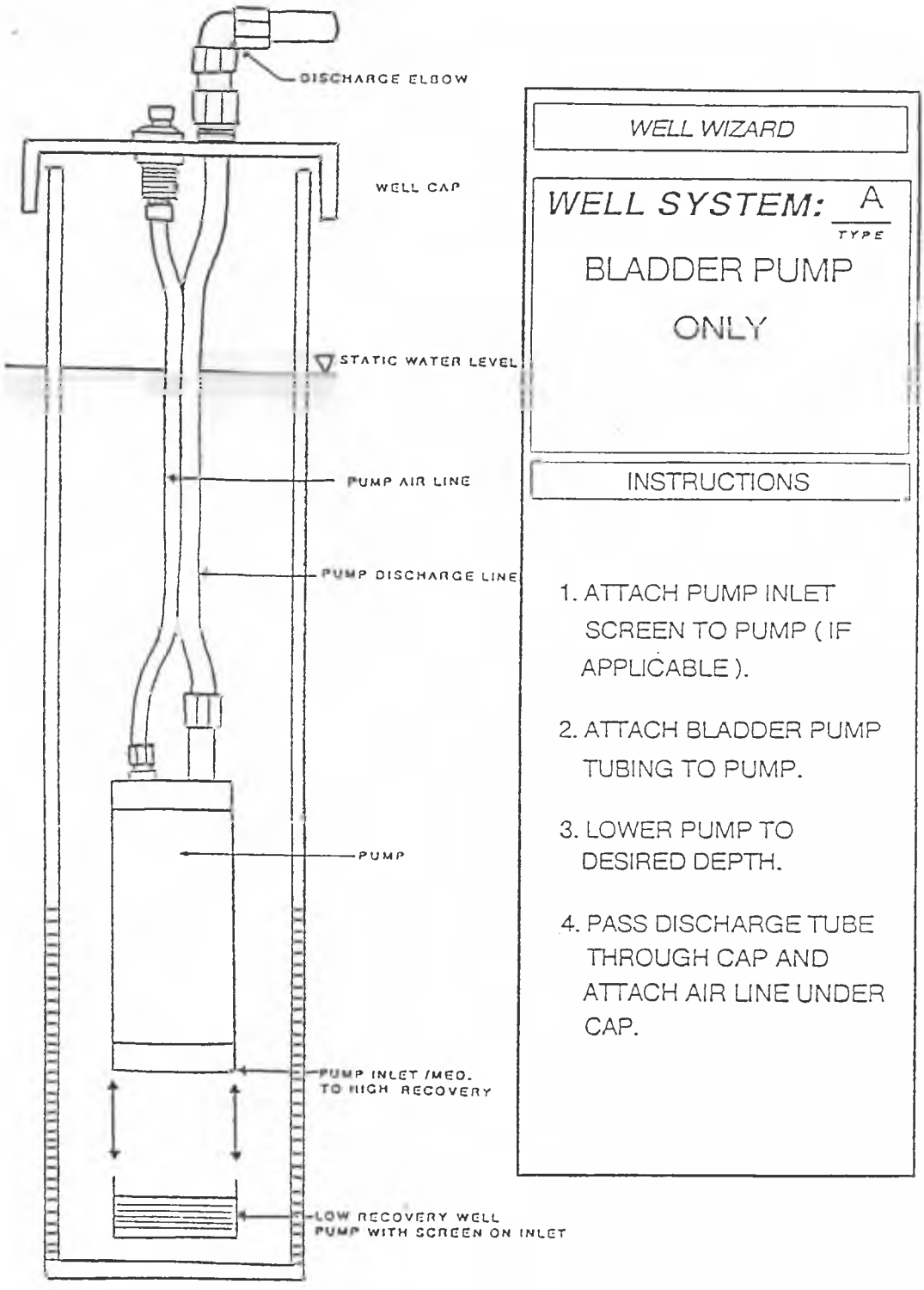


Figure A-2. Well Wizard Schematic

Drilling began on MW-E on June 20th, 1990 and was completed on June 22nd. In addition to the usual cuttings samples an undisturbed soil sample was obtained utilizing a brass ring sampler at a depth of 56.5-58 feet. Very hard caliche layers were encountered between 7 and 9 feet. Ground water was originally encountered at a depth of 35 to 37 feet b.g.s., with a static level after installation of 32.1 feet. Very dense cemented gravels were encountered at a depth of 64 feet and impeded drilling and casing advancement to the final depth of 124 feet. The driller was unable to drive the casing beyond 92 feet, after which the boring was advanced without casing. Casing jacks were unsuccessfully deployed in an attempt to pull the 6 inch drive casing. Under the guidance of Mark Ader of the Washington Dept. of Ecology, Yakima, the casing was cut off at ground level, and overdrilled with ten inch casing to a depth of 18 feet and sealed with bentonite grout. The bottom of the 2.5 foot 0.020" slot screen was placed at a depth of 123 feet.

Well MW-E was developed on July 9th, 1990 for a period of 45 minutes until the discharge had cleared and stable pH and conductivity readings were obtained. A pH of 6.7 and a conductivity of 840 micro-mhos were recorded.

8.0 MONITORING WELL MW-F

This well was drilled, installed, and developed between June 22th and July 9th, 1990.

Drilling on boring MW-F was started and completed on June 22nd, 1990. Cemented gravels were encountered between 20 feet and the final depth of 55 feet. At a depth of 33 feet the driller could not efficiently drive the casing further, and the hole was continued without casing. Ground water was initially encountered at a depth of 35 feet b.g.s., with a static level after installation of 32.3 feet. The bottom of the 10 foot 0.020" slotted screen was set at a depth of 45 feet. Initial attempts at pulling the casing revealed that the PVC well was jammed in the casing. The PVC well had to be pulled with the casing. The hole was redrilled back down to 55 feet. The hole was flushed for several minutes with air until a consistent flow of clear water was attained. The well screen was then reset at the original depth of 45 feet.

Well MW-F was developed on July 9th, 1990 for a period of 1.5 hours until the discharge had cleared and stable pH and conductivity readings were obtained. After development a pH of 6.6 and a conductivity of 910 micro-mhos was recorded.

9.0 MONITORING WELL MW-G

This well was drilled, installed, and developed between June 18th and July 9th, 1990.

Drilling began on MW-G on June 18th, 1990 and was completed on June 19th. Very hard caliche was encountered between 9.5 and 12.5 feet. Minor water was perched on the caliche layer. A cobble layer was encountered at 21 feet, and auger refusal prompted the switch from auger to air-rotary drilling. Ground water was encountered at 36 feet b.g.s., with a static level after installation of 34.2 feet. Cemented gravels were encountered from 40 feet to the final depth of 52 feet. The bottom of a 10 foot 0.020" slotted screen was set at depth of 47.0 feet.

Well MW-G was developed on July 9th, 1990 for a period of 1.5 hours until the discharge had cleared and stable pH and conductivity readings were obtained. After development a pH of 6.7 and a conductivity of 940 micro-mhos was recorded.

TABLE A-1

Monitoring Well Data Summary
Yakima Agricultural Research Lab

Well No.	Ground Surface Elevation Feet	Top of Casing Elevation Feet	Drill Depth Feet	Screen Depth Feet B.G.S.	Screen Elevation Feet
MW-A	1141.54	1144.86	46	32-42	1109.54-1099.54
MW-B	1141.94	1144.47	50	37-47	1104.94-1094.94
MW-C	1140.98	1144.28	50	32-42	1108.98-1098.98
MW-D	1141.00	1141.00	90	36-46	1105.00-1095.00
MW-E	1141.03	1143.52	124	120.5-123	1020.53-1018.03
MW-F	1141.28	1144.18	55	35-45	1106.28-1096.28
MW-G	1142.43	1144.99	52	37-47	1105.43-1095.43

Appendix 1

MONITORING WELL LOGS

HONG WEST & ASSOCIATES

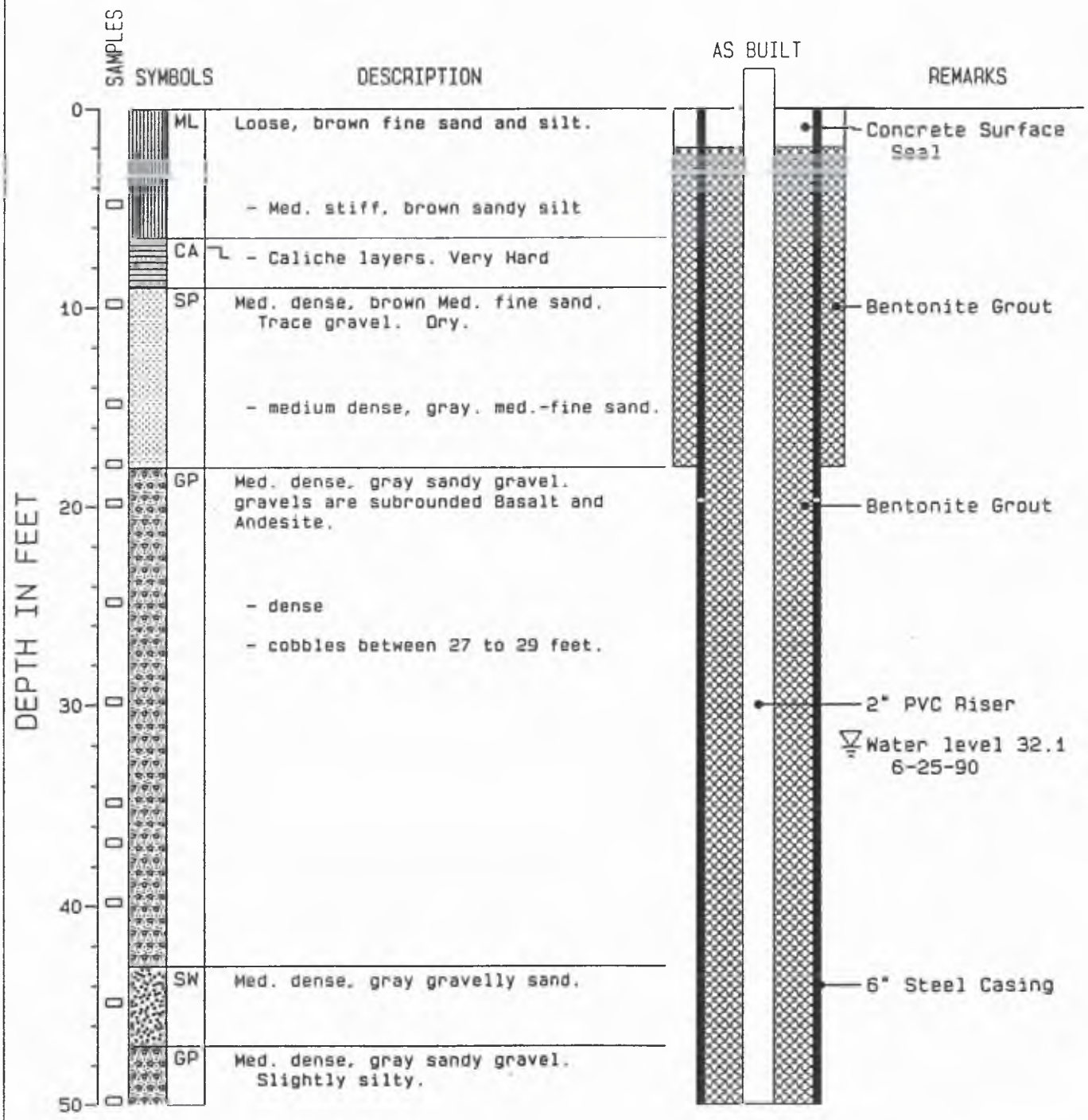
P.O. BOX 596, LYNNWOOD, WASHINGTON 98046, (206) 774-0106

DRILLING COMPANY: Ponderosa Drilling
DRILLING METHOD: Air Rotary - Tricone
SAMPLING METHOD: Grab Sample From Air Discharge Tube.

WELL LOG

LOGGED BY: Steve Greene

TOTAL DEPTH: 124 FEET
DATE STARTED: 6-20-90
DATE FINISHED: 6-22-90

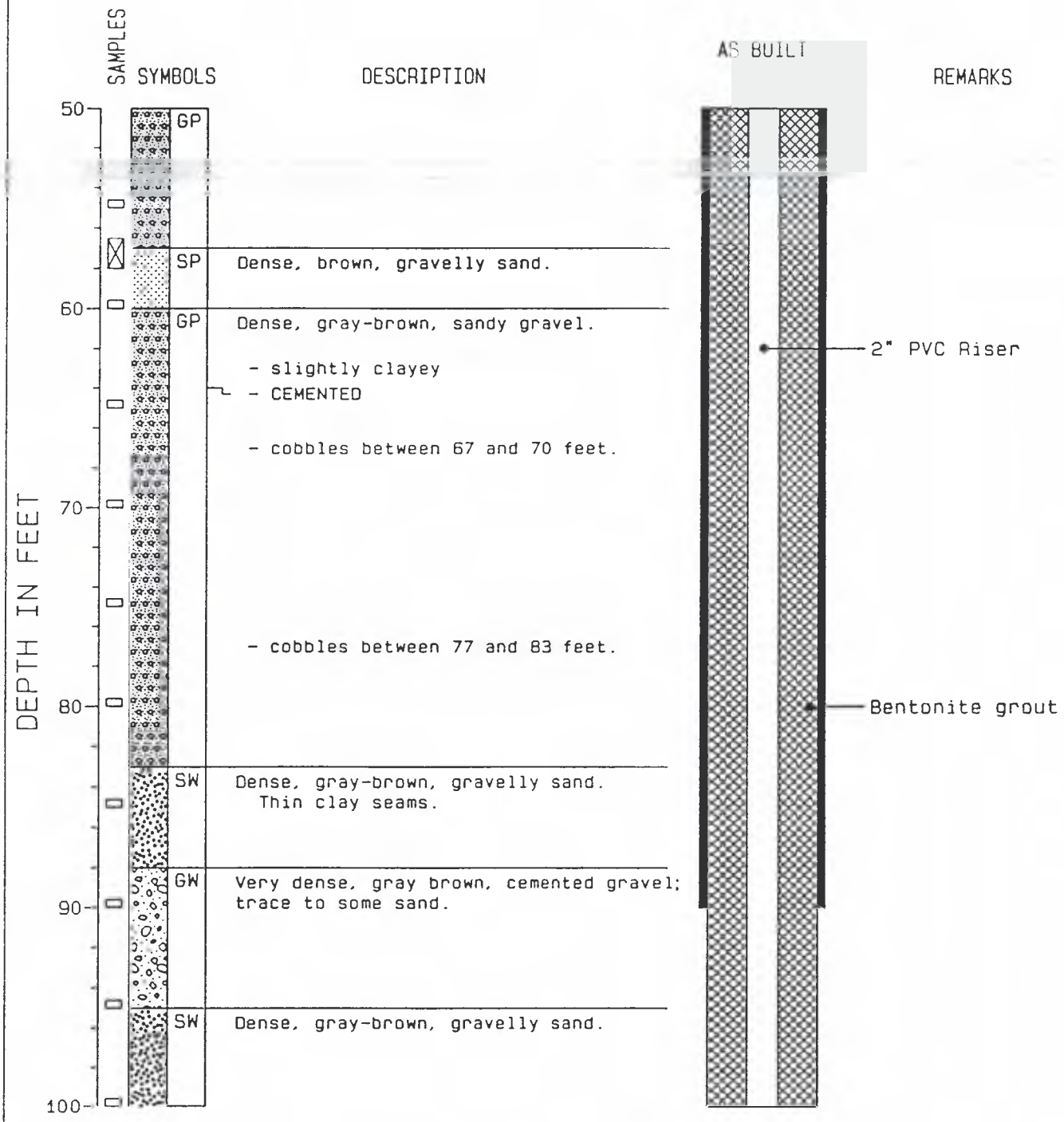


PROJECT: YARL
LOCATION: 3706 W. Nob Hill Rd., Yakima, WA
SURFACE ELEVATION: 1141.03 ft.
TOP OF WELL CASING: 1143.52 ft.

WELL MW-E

PROJECT NUMBER: 90042

HONG WEST & ASSOCIATES
WELL LOG

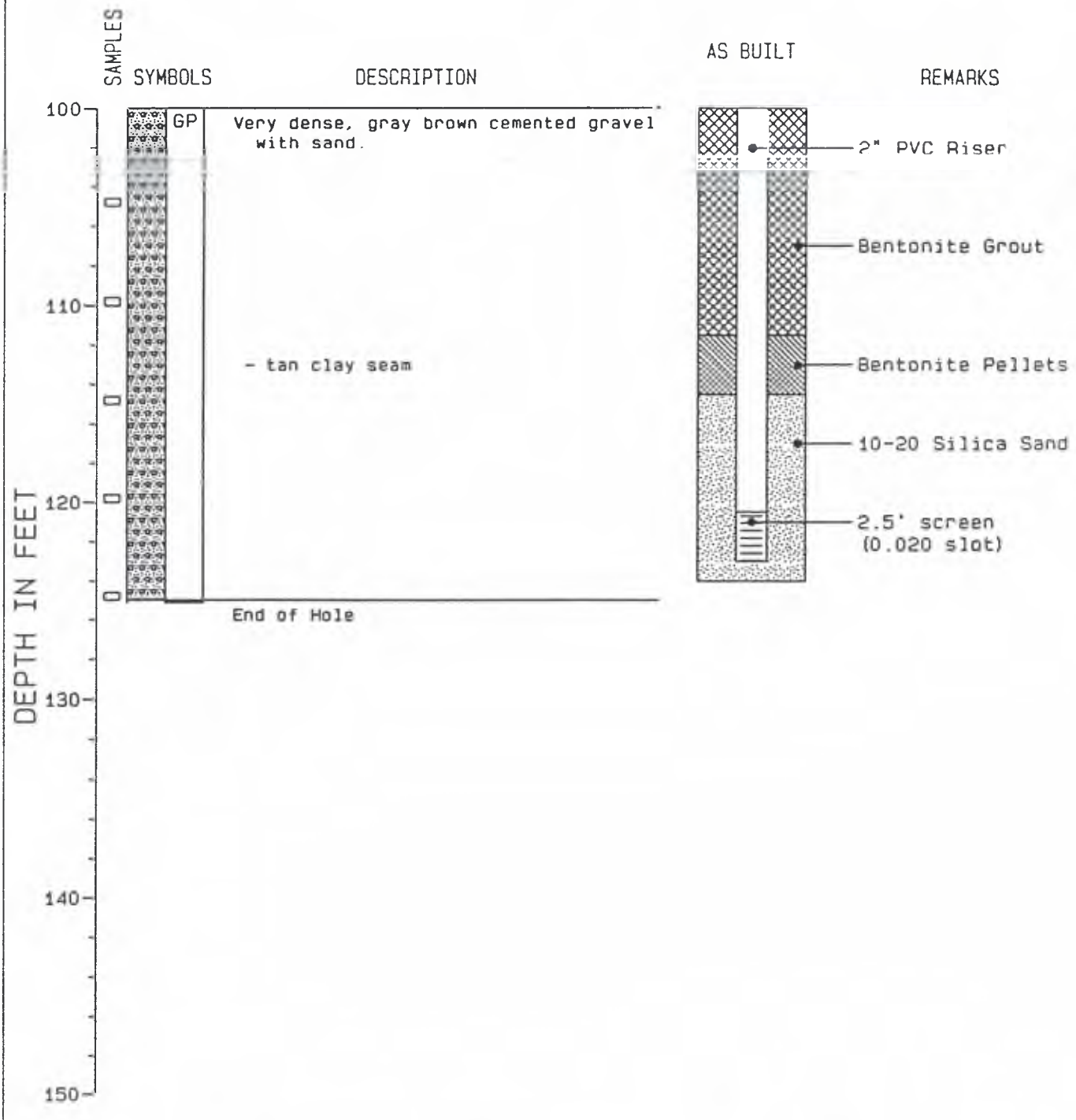


PROJECT: YARL
LOCATION: 3706 W. Nob Hill Rd., Yakima, WA
SURFACE ELEVATION: 1141.03 ft.
TOP OF WELL CASING: 1143.52 ft.

WELL MW-E

PROJECT NUMBER: 90042

HONG WEST & ASSOCIATES
WELL LOG



PROJECT: YARL
LOCATION: 3706 W. Nob Hill Rd., Yakima, WA
SURFACE ELEVATION: 1141.03 ft.
TOP OF WELL CASING: 1143.52 ft.

WELL MW-E

PROJECT NUMBER: 90042

HONG WEST & ASSOCIATES

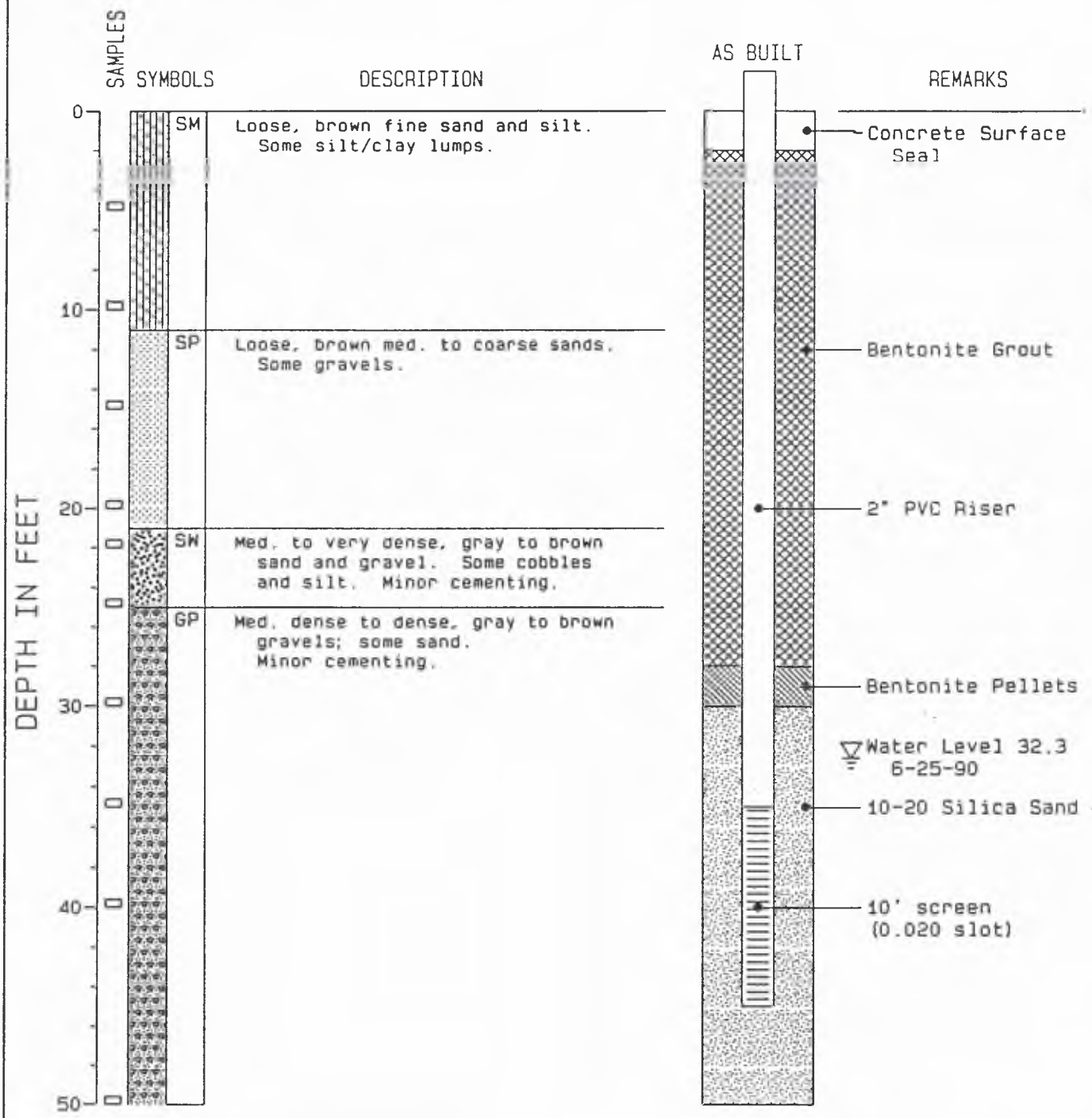
P.O. BOX 596, LYNNWOOD, WASHINGTON 98046, (206) 774-0106

WELL LOG

LOGGED BY: Dan Howard

DRILLING COMPANY: Ponderosa Drilling
DRILLING METHOD: Air Rotary - Tricone
SAMPLING METHOD: Grab Sample From Air Discharge Tube.

TOTAL DEPTH: 55 FEET
DATE STARTED: 6-22-90
DATE FINISHED: 6-22-90

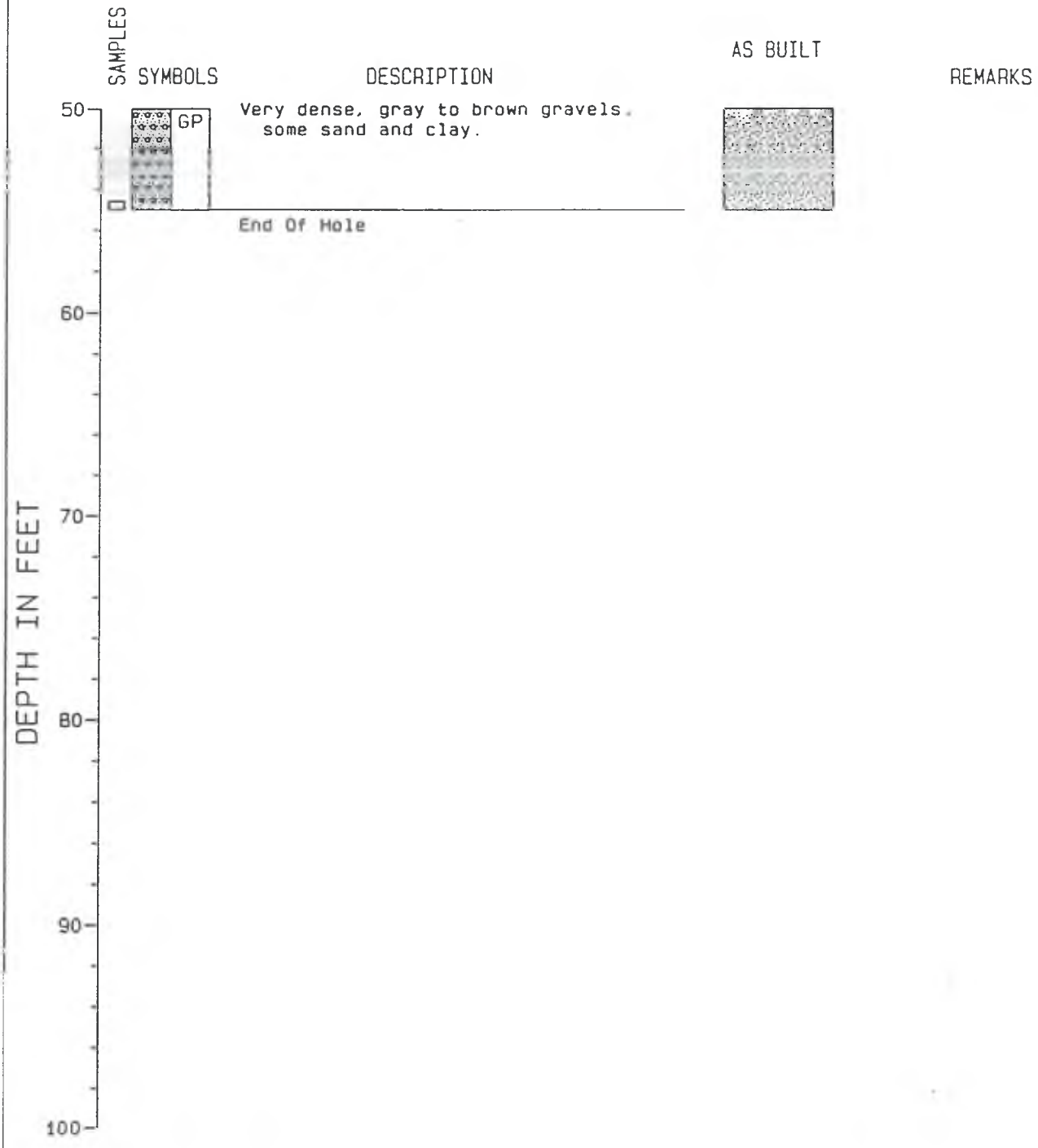


PROJECT: YARL
LOCATION: 3706 W. Nob Hill Rd., Yakima, WA
SURFACE ELEVATION: 1141.28 ft.
TOP OF WELL CASING: 1144.18 ft.

WELL MW-F

PROJECT NUMBER: 90042

HONG WEST & ASSOCIATES
WELL LOG



PROJECT: YARL
LOCATION: 3706 W. Nob Hill Rd., Yakima, WA
SURFACE ELEVATION: 1141.28 ft.
TOP OF WELL CASING: 1144.18 ft.

WELL MW-F

PROJECT NUMBER: 90042

HONG WEST & ASSOCIATES

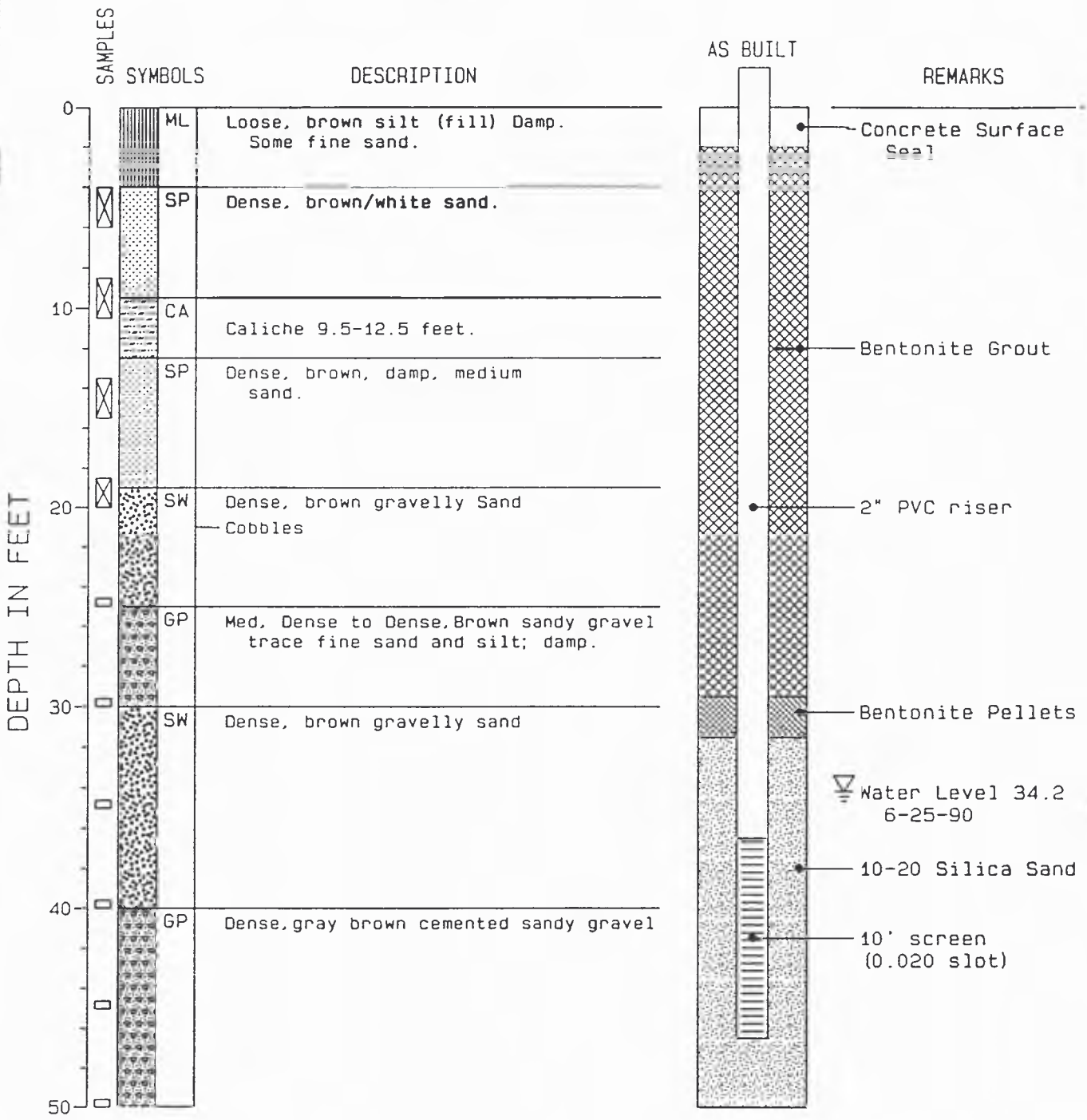
P.O. BOX 596, LYNNWOOD, WASHINGTON 98046, (206) 774-0106

WELL LOG

LOGGED BY: Larry West/Doug Geller

DRILLING COMPANY: Ponderosa Drilling
DRILLING METHOD: Hollow Stem Auger 0-21', Air Rotary 21-52
SAMPLING METHOD: Split Spoon. Grab Sample-Air Discharge.

TOTAL DEPTH: 52 FEET
DATE STARTED: 6-18-90
DATE FINISHED: 6-19-90

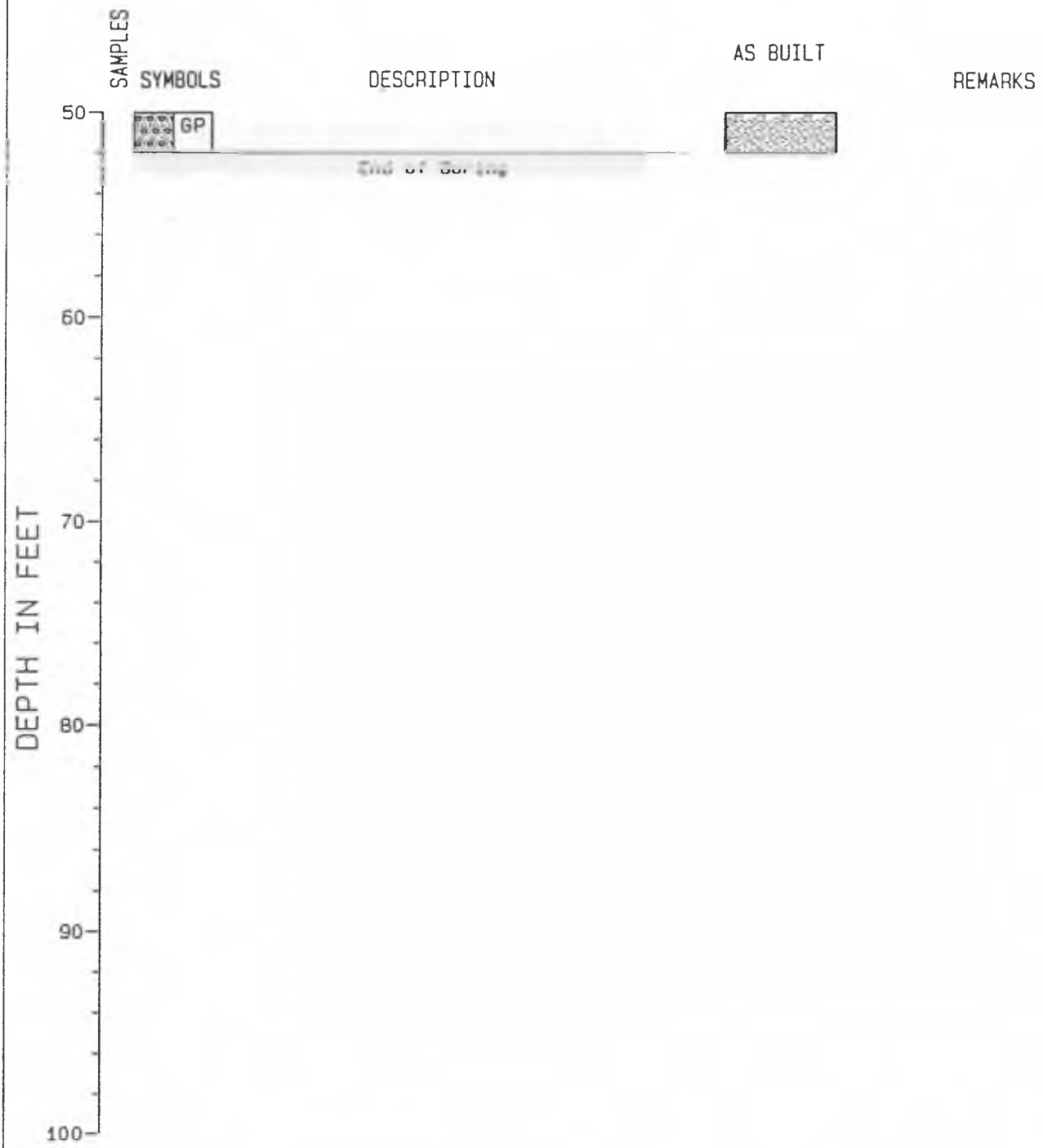


PROJECT: YARL
LOCATION: 3706 W. Nob Hill Rd., Yakima, WA
SURFACE ELEVATION: 1142.43 ft.
TOP OF WELL CASING: 1144.99 ft.

WELL MW-G

PROJECT NUMBER: 90042

HONG WEST & ASSOCIATES
WELL LOG



PROJECT: YARL
LOCATION: 3706 W. Nob Hill Rd., Yakima, WA
SURFACE ELEVATION: 1142.43 ft.
TOP OF WELL CASING: 1144.99 ft.

WELL MW-G

PROJECT NUMBER: 90042

Appendix 2

Soil Testing Results

HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Yakima Ag. Research Lab.

Project Number: 90042

Date Tested: 7-12-90

Remarks: Gray-brown, Well graded SAND with gravel (SW)

Test Hole Number: MW-F

Sample Number: S-1

Depth: 45-50 feet

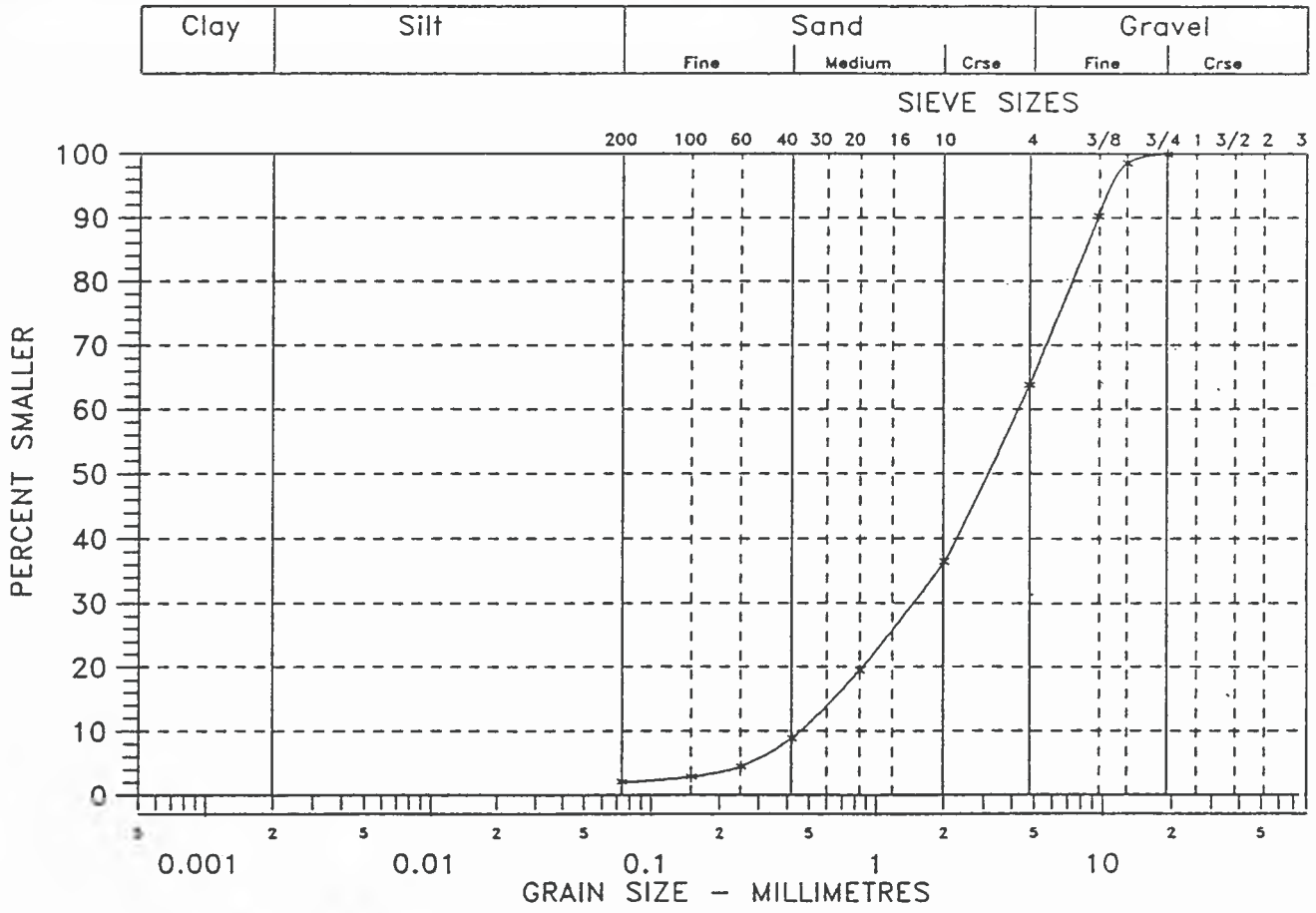
Sample Description:

Gravel: 36.1

Sand: 61.9

Silt: 2.0

Clay:



Reviewed By:

HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Yakima Ag. Research Lab.

Project Number: 90042

Date Tested: 7-12-90

Remarks: Gray-brown, Well graded SAND with gravel (SW)

Test Hole Number: MW-E

Sample Number: S-4

Depth: 120 feet

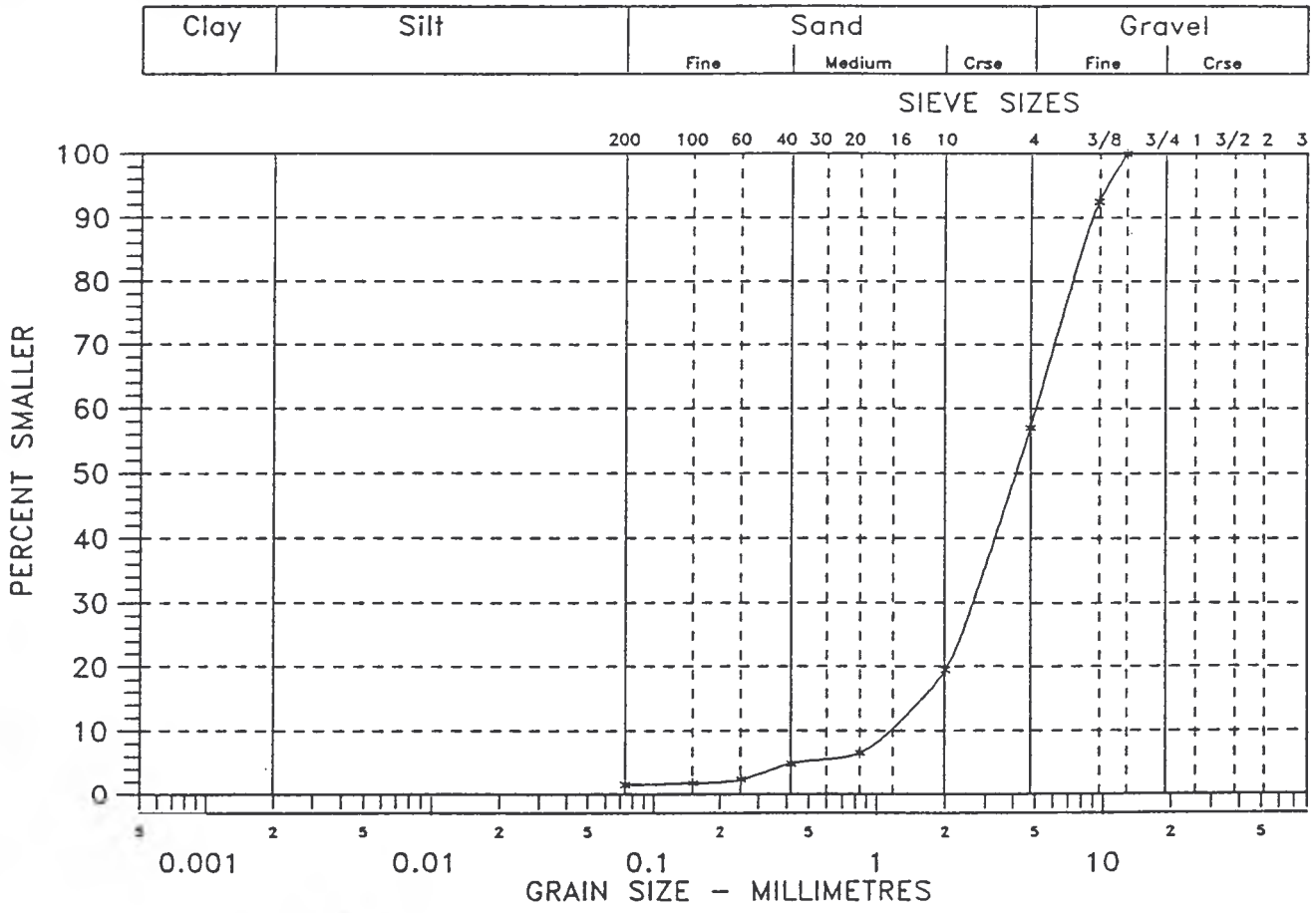
Sample Description:

Gravel: 43.0

Sand: 55.4

Silt: 1.6

Clay:



Reviewed By:

HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Yakima Ag. Research Lab.

Project Number: 90042

Date Tested: 7-12-90

Remarks: Brown, poorly graded GRAVEL ; some silt (GP-GM)

Test Hole Number: MW-E

Sample Number: S-3

Depth: 56.5 feet

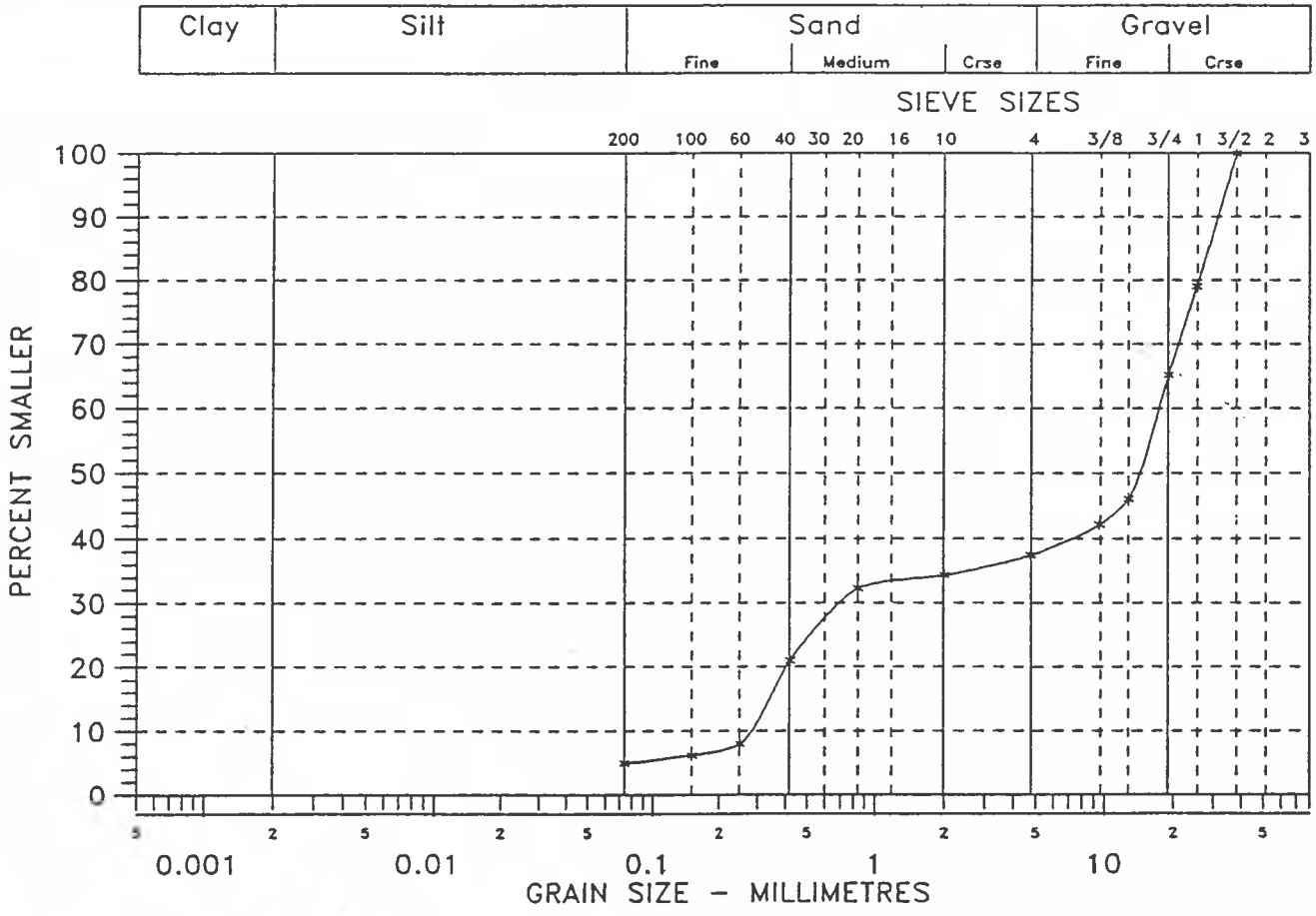
Sample Description:

Gravel: 62.6

Sand: 32.4

Silt: 5.0

Clay:



Reviewed By:

HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Yakima Ag. Research Lab.

Project Number: 90042

Date Tested: 7-12-90

Remarks: Gray, silty SAND (SM)

Test Hole Number: MW-E

Sample Number: S-2

Depth: 10 to 15 feet

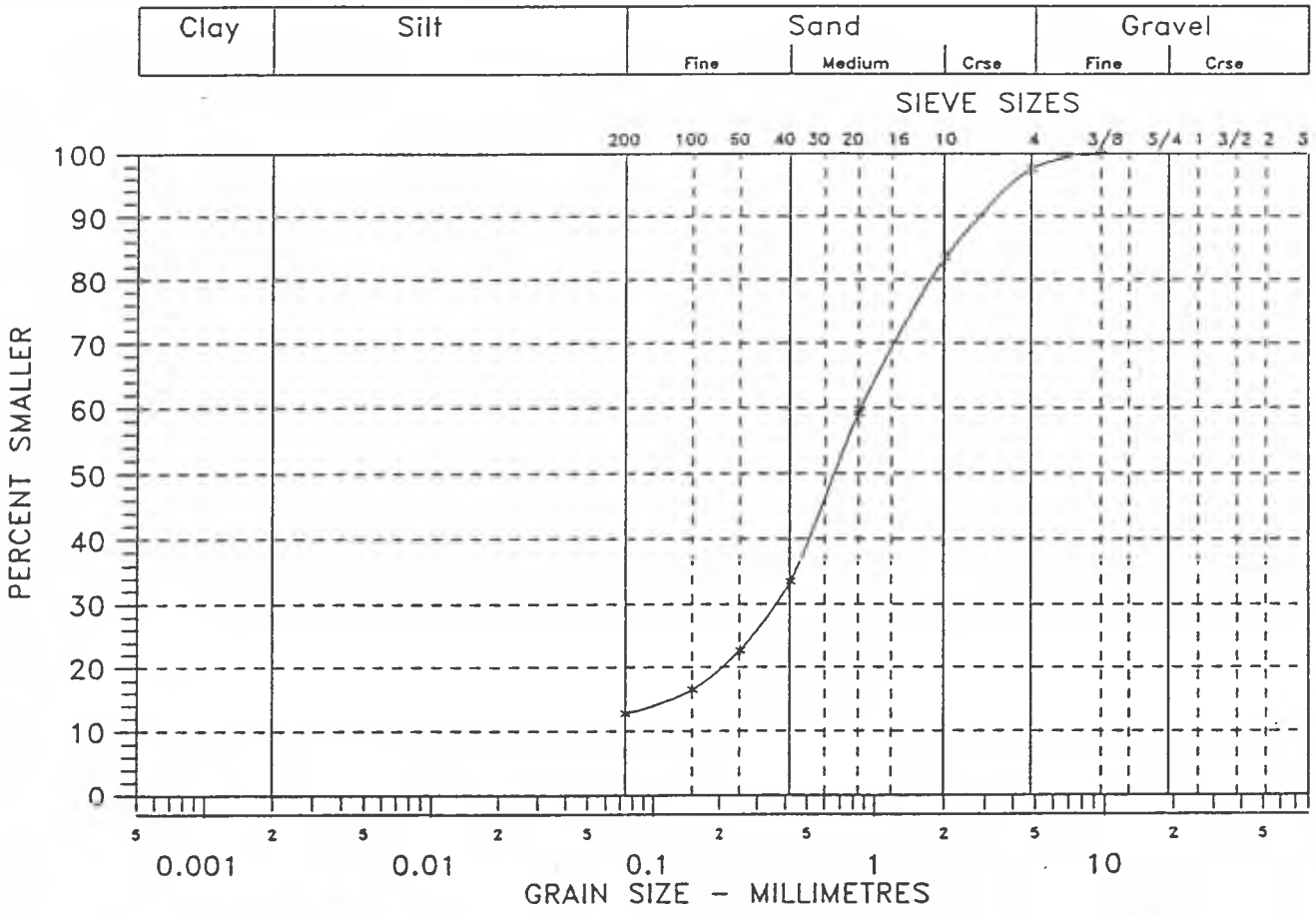
Sample Description:

Gravel: 2.4

Sand: 84.8

Silt: 12.8

Clay:



Reviewed By:

HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Yakima Ag. Research Lab.

Project Number: 90042

Date Tested: 7-12-90

Remarks: Brown, sandy SILT (ML)

Test Hole Number: MW-E

Sample Number: S-1

Depth: 0 to 5 feet

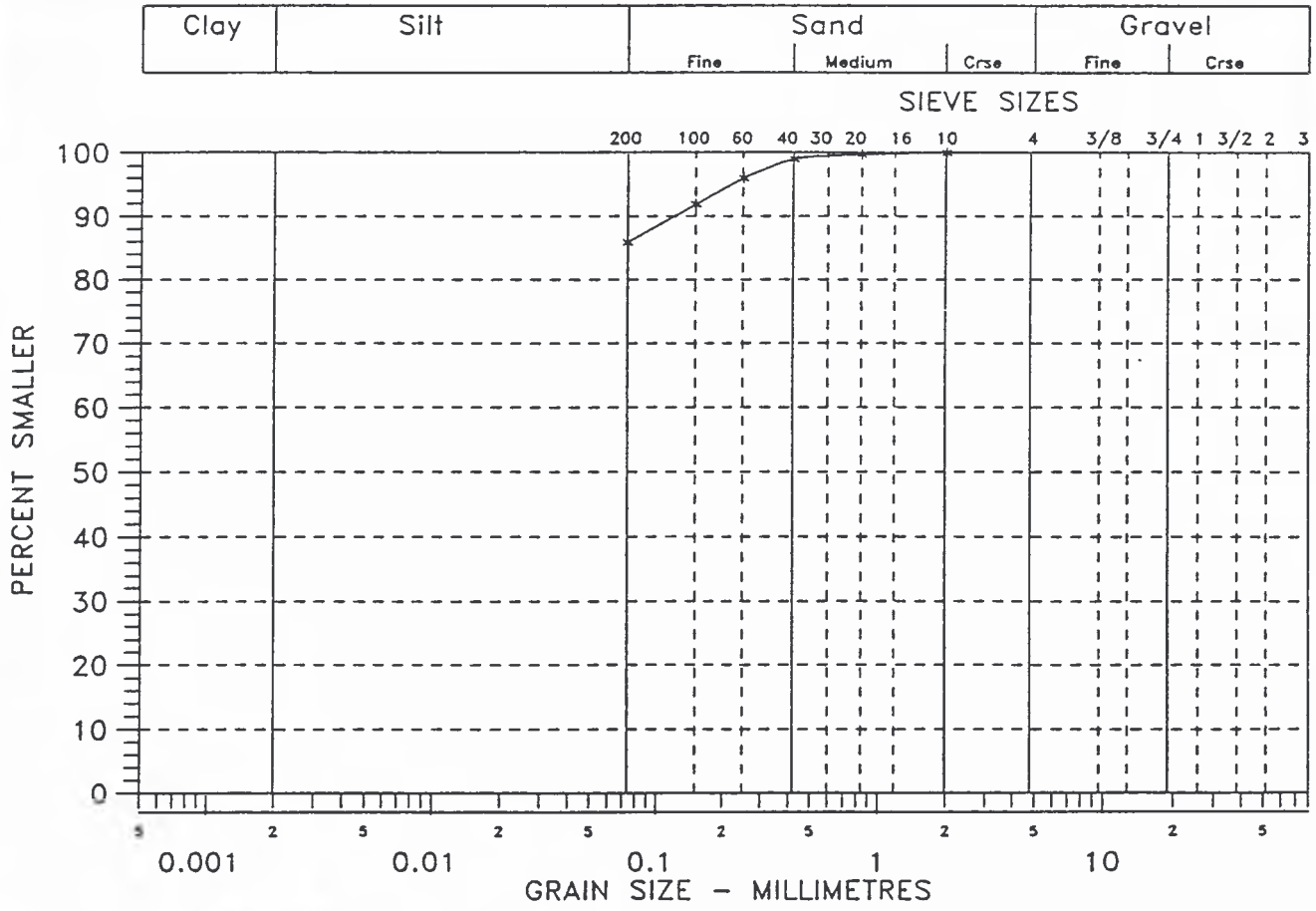
Sample Description:

Gravel:

Sand: 14.1

Silt: 85.9

Clay:



Reviewed By:

HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Yakima Ag. Research Lab.

Project Number: 90042

Date Tested: 7-12-90

Remarks: Gray-brown, Poorly graded SAND with gravel (SP)

Test Hole Number: MW-F

Sample Number: S-1

Depth: 45-50 feet

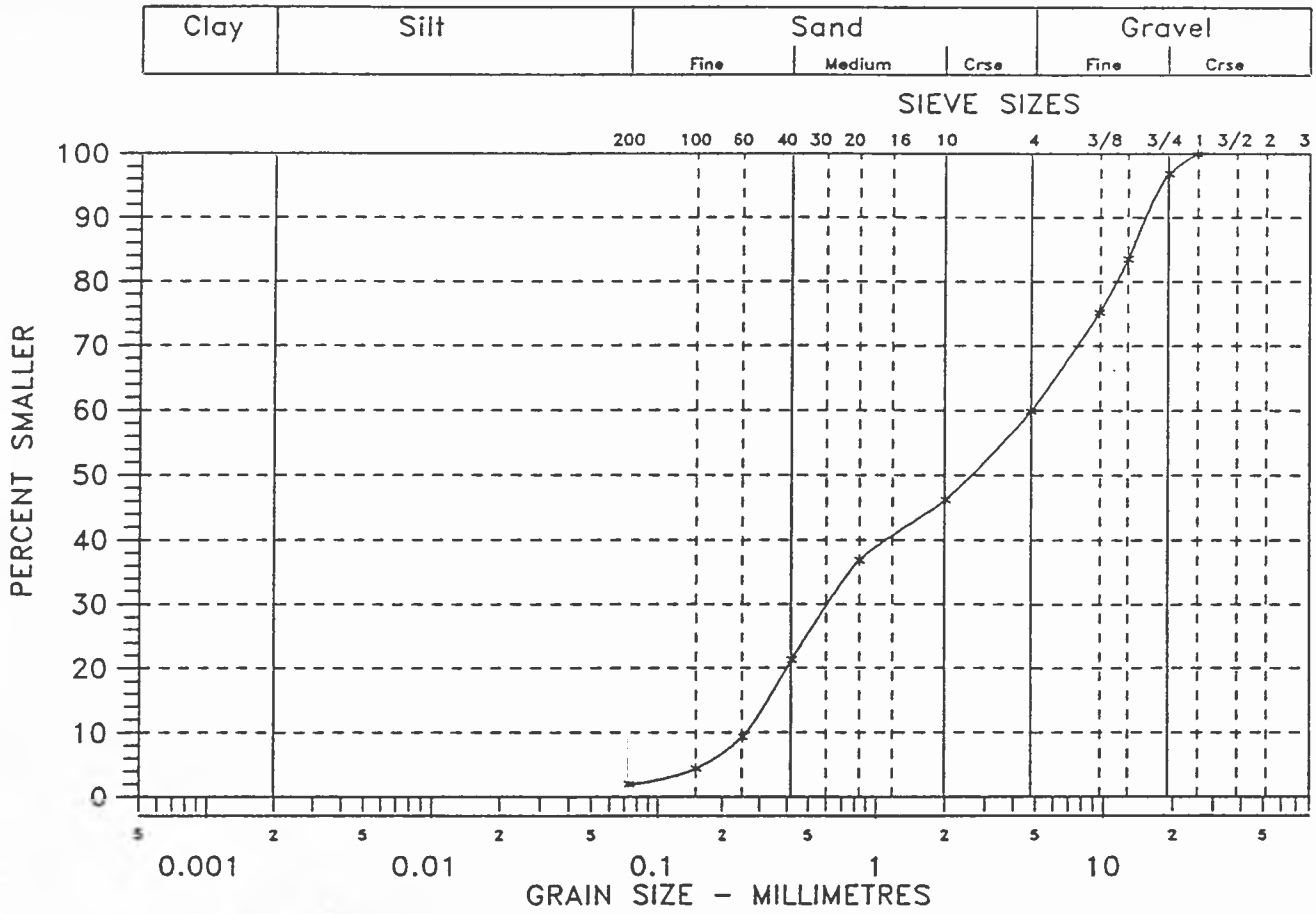
Sample Description:

Gravel: 36.1

Sand: 61.9

Silt: 2.0

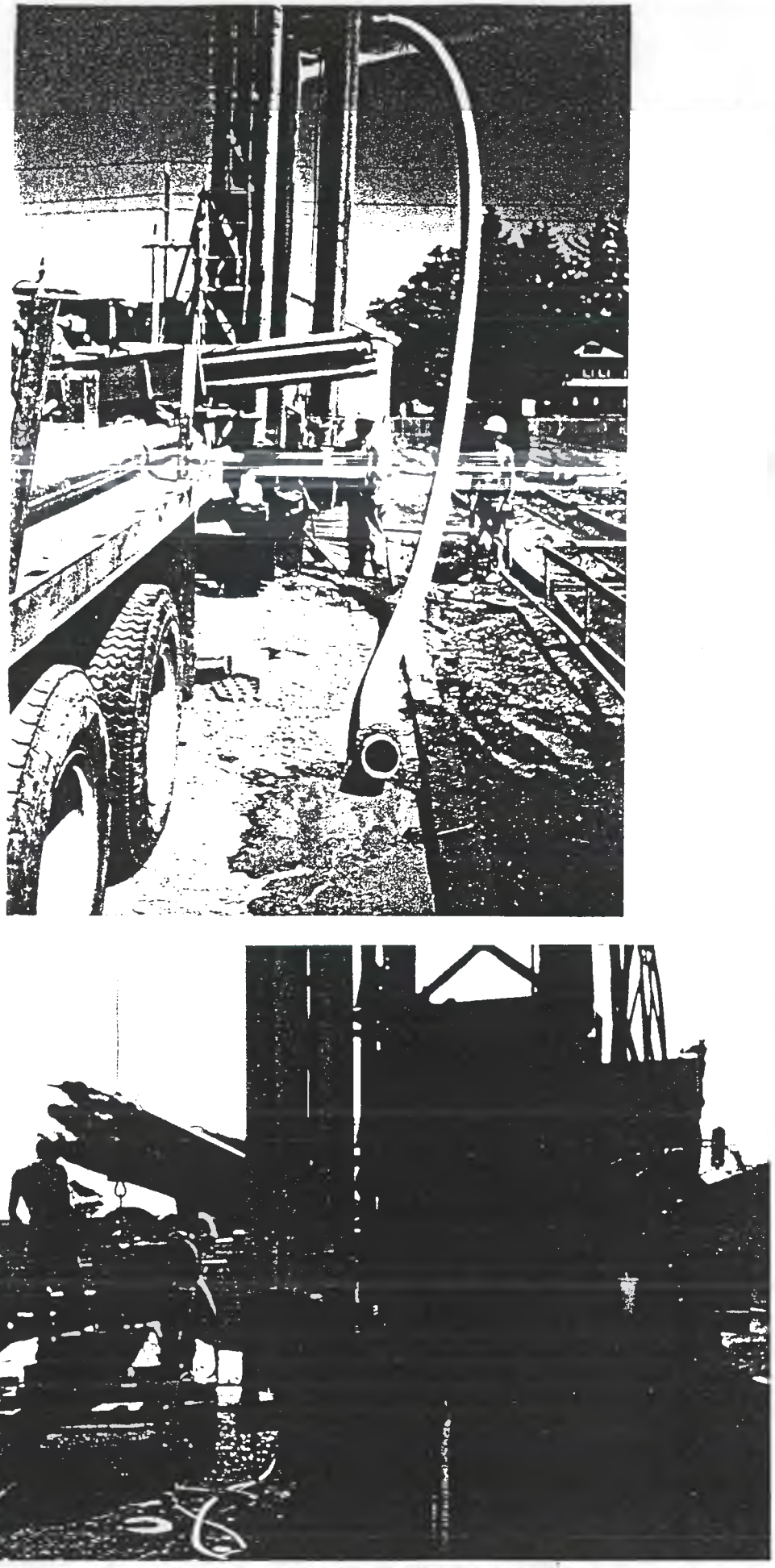
Clay:



Reviewed By:

Appendix 3

Well Construction Photographs



Drilling (top) and pressure grouting (bottom) of boring MW-G. Photos taken on June 19, 1990.